

CLAIMS

WE CLAIM:

1. A guided wave radar transmitter comprising:
2 a probe defining a transmission line and including a relatively low impedance
change target marker above an expected sensing region of the probe;
4 a pulse circuit connected to the probe for generating pulses on the transmission
line and receiving a reflected signal from the transmission line, the reflected signal selectively
6 including a target pulse representing the target marker and a level pulse representing material
along length of the probe; and
8 a controller operatively connected to the pulse circuit, the controller normally
operating at a relatively low gain to determine a level time to the level pulse to determine
10 material level, and periodically operating at a relatively high gain to determine a target time to
the target pulse, the target time being used to compensate the level time for properties of vapor
12 above the material level.

2. The guided wave radar transmitter of claim 1 wherein the probe
2 comprises a probe shaft and the target marker comprises a sleeve secured to the probe shaft.

3. The guided wave radar transmitter of claim 1 wherein the controller stores

2 a calibrated target time and compares the determined target time to the calibrated target time to
compensate the level time for properties of vapor above the material level.

4. The guided wave radar transmitter of claim 1 wherein the controller stores
2 a calibrated target time and determines a ratio of calibrated target time to the determined target
time to compensate the level time for properties of vapor above the material level.

5. The guided wave radar transmitter of claim 4 wherein the ratio is used to
2 determine approximate temperature and the controller adjusts time of a fiducial pulse responsive
to the determined approximate temperature.

6. The guided wave radar transmitter of claim 1 wherein the pulse circuit
2 comprises a constant fraction discriminator for determining pulse times and the constant fraction
discriminator is disabled when the controller operates at the relatively high gain.

7. The guided wave radar transmitter of claim 1 wherein the controller
2 comprises an automatic gain control of the relatively high gain.

8. The guided wave radar transmitter of claim 7 wherein the automatic gain
4 control selectively increases or decreases the relatively high gain to ensure that the target pulse is

sensed.

6 9. A time domain reflectometry measurement instrument comprising:
 a probe defining a transmission line and including a reference marker proximate a
8 top end of the probe and a relatively low impedance change target marker above an expected
 sensing region of the probe;
10 a pulse circuit connected to the probe for generating pulses on the transmission
 line and receiving a reflected signal from the transmission line, the reflected signal selectively
12 including a fiducial pulse the reference marker, a target pulse representing the target marker and
 a level pulse representing material along length of the probe; and
14 a time sampling circuit connected to the pulse circuit for developing a time
 representation of the reflected signal;
16 a controller operatively connected to the pulse circuit and the time sampling
 circuit, the controller comprising measurement means operating at a relatively low gain for
18 determining a level time between the fiducial pulse and the level pulse to determine material
 level, and target means operating at a relatively high gain to determine a target time between the
20 fiducial pulse and the target pulse, the controller selectively operating either the measurement
 means or the target means, the target time being used to compensate the level time for properties
22 of vapor above the material level.

 10. The time domain reflectometry measurement instrument of claim 9
2 wherein the controller normally operates the measurement means and periodically operates the

target means.

11. The time domain reflectometry measurement instrument of claim 9

2 wherein the probe comprises a probe shaft and the target marker comprises a sleeve secured to
the probe shaft.

12. The time domain reflectometry measurement instrument of claim 9

2 wherein the controller stores a calibrated target time and the target means compares the
determined target time to the calibrated target time to compensate the level time for properties of
4 vapor above the material level.

13. The time domain reflectometry measurement instrument of claim 9

2 wherein the controller stores a calibrated target time and the target means determines a ratio of
calibrated target time to the determined target time to compensate the level time for properties of
4 vapor above the material level.

14. The time domain reflectometry measurement instrument of claim 13

2 wherein the ratio is used to determine approximate temperature and the controller adjusts time of
the fiducial pulse responsive to the determined approximate temperature.

15. The time domain reflectometry measurement instrument of claim 9
- 2 wherein the pulse circuit comprises a constant fraction discriminator for determining pulse times and the constant fraction discriminator is disabled when the controller operates the target means.

16. The time domain reflectometry measurement of claim 9 wherein the controller comprises an automatic gain control of the relatively high gain.

17. The time domain reflectometry measurement instrument of claim 16 wherein the automatic gain control selectively increases or decreases the relatively high gain to ensure that the target pulse is sensed.

18. A guided wave radar transmitter comprising:

2 a probe defining a transmission line and including a reference marker proximate a
top end of the probe and a relatively low impedance change target marker above an expected
4 sensing region of the probe;

a pulse circuit connected to the probe for generating pulses on the transmission
6 line and receiving a reflected signal from the transmission line, the reflected signal selectively
including a fiducial pulse representing the reference marker, a target pulse representing the target
8 marker and a level pulse representing material along length of the probe; and

a controller operatively connected to the pulse circuit, the controller normally
10 operating at a relatively low gain to determine a level time between the fiducial pulse and the
level pulse to determine material level based on the level time, and periodically operating at a
12 relatively high gain to determine a target time between the fiducial pulse and the target pulse, and
comparing the determined target time to a calibrated target time, representing propagation
14 through air, to determine velocity compensation amount, the velocity compensation amount
being used to compensate the level time for properties of vapor above the material level.

19. A guided wave radar transmitter of claim 18 further comprising a time
2 sampling circuit connected to the pulse circuit and operatively associate with the controller for
developing a time representation of the reflected signal.

20. The guided wave radar transmitter of claim 18 wherein the probe
2 comprises a probe shaft and the target marker comprises a sleeve secured to the probe shaft.

21. The guided wave radar transmitter of claim 18 wherein the controller
2 stores a calibrated target time and compares the determined target time to the calibrated target
time to compensate the level time for properties of vapor above the material level.

22. The guided wave radar transmitter of claim 18 wherein the controller
2 stores a calibrated target time and determines a ratio of calibrated target time to the determined
target time to compensate the level time for properties of vapor above the material level.

23. The guided wave radar transmitter of claim 22 wherein the ratio is used to
2 determine approximate temperature and the controller adjusts time of the fiducial pulse
responsive to the determined approximate temperature.

24. The guided wave radar transmitter of claim 18 wherein the pulse circuit
2 comprises a constant fraction discriminator for determining pulse times and the constant fraction
discriminator is disabled when the controller operates at the relatively high gain.

25. The guided wave radar transmitter of claim 18 wherein the controller

comprises an automatic gain control of the relatively high gain.

26. The guided wave radar transmitter of claim 25 wherein the automatic gain control selectively increases or decreases the relatively high gain to ensure that the target pulse is sensed.